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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/783,249

02/19/2004

John L. Fulton

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EXAMINER

BLAN, NICOLE R

ART UNIT

PAPER NUMBER

1762

MAIL DATE

DELIVERY MODE

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PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

<b>Office Action Summary</b>	<b>Application No.</b>	<b>Applicant(s)</b>	
	10/783,249	FULTON ET AL.	
	<b>Examiner</b>	<b>Art Unit</b>	
	Nicole Blan	1762	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

#### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

- 1) ☒ Responsive to communication(s) filed on 19 February 2004.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

- 4) ☒ Claim(s) 3,5-8,12,16-23,26,27,29,31,32,40,42-44 and 50-70 is/are pending in the application.
- 4a) Of the above claim(s) 3,5-8,12,16-23,26,27,29,31,32,40, and 42-44 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 50-70 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

#### Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 19 February 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

#### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

#### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)            | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)   | Paper No(s)/Mail Date. _____                                      |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>02112005, 10072005, 11032005</u> .                            | 6) <input type="checkbox"/> Other: _____                          |

### DETAILED ACTION

1. Applicant's election without traverse of Group I, species 4 in the reply filed on August 21, 2007 is acknowledged.

#### *Claim Rejections - 35 USC § 112*

2. Claim 53 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Claim 53 appears to contradict claim 52 because claim 53 wants a reduced density for supercritical CO<sub>2</sub> whereas claim 52 wants the density to be above the critical density of CO<sub>2</sub>. It is not clear what the reduced density is compared to in order to determine that it has in fact been reduced, what density is being discussed in the claim, and what unit is the density is being measured in. In regards to the range from 1 to about 3, is 1 signifying the critical density?

#### *Claim Rejections - 35 USC § 102*

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

The changes made to 35 U.S.C. 102(e) by the American Inventors Protection Act of 1999 (AIPA) and the Intellectual Property and High Technology Technical Amendments Act of 2002 do not apply when the reference is a U.S. patent resulting directly or indirectly from an international application filed before November 29, 2000. Therefore, the prior art date of the

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reference is determined under 35 U.S.C. 102(e) prior to the amendment by the AIPA (pre-AIPA 35 U.S.C. 102(e)).

4. Claims 50-51 and 62-70 are rejected under 35 U.S.C. 102(e) as being anticipated by DeYoung et al. (U.S. PGPub 2003/0033676, hereafter '676).

Claim 50: A process for removing a residue from a surface [page 10, paragraph 116, lines 1-5], comprising the steps of: mixing [page 7, paragraph 88, lines 1-6 and page 10, paragraph 117, lines 1-6] a densified fluid [page 4, paragraph 56, lines 16-21] with at least one reverse-micelle-forming surfactant [page 4, paragraph 58] and at least one chemical reagent [page 5, paragraph 65, lines 1-2 and 21-22]; wherein said at least one surfactant and said at least one reagent in said densified fluid form a plurality of reactive reverse-micelles operable for removing said residue [page 4, paragraph 56, lines 16-20]; contacting said residue with said fluid containing said reactive reverse-micelles [page 10, paragraph 117, lines 4-6]; and wherein said residue is chemically removed from said surface by action of said reactive reverse-micelles in said fluid [page 10, paragraph 117].

Claim 51: The process according to Claim 50, wherein said densified fluid comprises carbon dioxide [page 4, paragraph 56, lines 16-20].

Claim 62: The process according to Claim 50, wherein said residue is an etch residue [page 10, paragraph 114, lines 1-3].

Claim 63: The process according to Claim 50, wherein said residue is a transition metal [page 10, paragraph 114, lines 1-3 discusses removing low k dielectric eth residues and page 9, paragraph 113, lines 6-8 states that it can be copper].

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Claim 64: The process according to Claim 50, wherein said residue is a metal-containing residue [page 9, paragraph 113, lines 6-8].

Claim 65: The process according to Claim 50, wherein said residue is Cu [page 9, paragraph 113, lines 6-8].

Claim 66: The process according to Claim 50, wherein said residue is a silicon-containing residue [page 9, paragraph 113, lines 1-4].

Claim 67: The process according to Claim 50, wherein said residue is an etch residue [page 10, paragraph 114, lines 1-3].

Claim 68: The process according to Claim 50, wherein said process is utilized in the process of manufacturing of a semiconductor substrate [page 10, paragraph 116].

Claim 69: The process according to Claim 50, wherein the step of contacting said residue with said fluid includes applying a predetermined quantity of said fluid with a fluid delivery system or device [page 2, paragraph 27, lines 1-8].

Claim 70: The process according to Claim 50, wherein said surface is a semiconductor surface or substrate [page 10, paragraph 114, lines 1-3].

***Claim Rejections - 35 USC § 103***

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

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6. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

7. Claims 52-54 are rejected under 35 U.S.C. 103(a) as being unpatentable over '676, and further in view of Joyce et al. (U.S. Patent 6,764,552, hereafter '552).

Claims 52-53: '676 teaches the limitations of claim 50 above. '676 teaches that a temperature below 31°C can ensure that the CO<sub>2</sub> remains densified [densified is taken to mean supercritical as disclosed in '676]. It does not teach the specific temperatures or pressures claimed. However, '552 teaches that the critical temperature and pressure for carbon dioxide are 31.0°C and 73.9 bar [col. 5, lines 20-22]. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to find the optimum values of temperature and pressure as recommended in '676 to keep the density above the critical density through routine experimentation.

Claim 54: '676 and '552 teach the limitations of claim 53 above. '676 also teaches at least one surfactant includes a CO<sub>2</sub>-philic surfactant and a non-CO<sub>2</sub>-philic surfactant [page 4, paragraph 61, lines 1-3].

8. Claims 55-61 are rejected under 35 U.S.C. 103(a) as being unpatentable over '676 and '552, and further in view of DeYoung et al. (U.S. PGPub 2004/0071873, hereafter '873).

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Claims 55-56: '676 and '552 teach the limitations of claim 53 above. '676 teaches that fluorocarbon-based surfactants can be used. However, '676 and '552 do not explicitly teach that at least one reverse micelle forming surfactant is selected from the group consisting of anionic surfactants, cationic surfactants, non-ionic surfactants, zwitterionic surfactants, and combinations thereof. However, '873 teaches that a perfluoropolyether surfactant [i.e. an anionic surfactant] can be mixed with CO<sub>2</sub> to remove etch residues from semiconductor wafers [page 7, paragraph 82; page 7, paragraph 83, lines 4-6]. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to use the surfactant of '873 as the surfactant of '676 because '873 teaches that PFPE surfactants combined with supercritical CO<sub>2</sub> removes etch residue from semiconductors. It would have been obvious to one of ordinary skill in the art at the time the invention was made to use the PFPE surfactants in combination with supercritical CO<sub>2</sub> as taught by '873 as the surfactant of '676 with a reasonable expectation of success because '873 teaches that it will remove etch residues from semiconductors.

Claims 57-58: '676, '552, and '873 teach the limitations of claim 56 above. '676 teaches that at least one reagent is ethanolamine [i.e. an alkanolamine, page 5, paragraph 65, lines 1-2 and 21-22].

Claim 59: '676, '552, and '873 teach the limitations of claim 57 above. '676 teaches that at least one reagent has a concentration of up to about 30% by volume in the fluid [page 4, paragraph 57].

Claim 60: '676, '552, and '873 teach the limitations of claim 57 above. '676 teaches that at least one reagent has a concentration from about 2% to 5% by volume in the fluid [page 4, paragraph 57].

Claim 61: '676, '552, and '873 teach the limitations of claim 57 above. '676 teaches that adding amines to the cleaning solution as a useful additive, but it does not teach the specific concentration. It would have been obvious to one of ordinary skill in the art at the time the invention was made to optimize the concentration of the amines by routine experimentation in view of an absence of unexpected results and in view of the terminology "about".

### ***Double Patenting***

9. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory obviousness-type double patenting rejection is appropriate where the conflicting claims are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., *In re Berg*, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent either is shown to be commonly owned with this application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement.

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).



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10. Claims 50-51, 57, and 61-65 are provisionally rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1-3, 6-7, and 17 of copending Application No. 10/851381. Although the conflicting claims are not identical, they are not patentably distinct from each other because, for example, claim 1 of the conflicting copending application substantially recites the manipulative steps by claim 50 of the instant application. Similarly, claim 2 of the conflicting copending application substantially recites the manipulative steps by claim 51 of the instant application. Similarly, claim 3 of the conflicting copending application substantially recites the manipulative steps by claim 57 of the instant application. Similarly, claims 6-7 of the conflicting copending application substantially recites the manipulative steps by claim 61 of the instant application. Similarly, claim 17 of the conflicting copending application substantially recites the manipulative steps by claims 62-65 of the instant application. The difference lies in that the copending application pertains to removing a deposition material from a surface; thereby the scope of the claims of the instant application is within the scope of the claims of the copending application.

This is a provisional obviousness-type double patenting rejection because the conflicting claims have not in fact been patented.

#### ***Information Disclosure Statement***

11. The references crossed out of the IDS by the Examiner were considered. They were lined through because they were duplicate references listed on the IDS submitted by the applicant.

#### ***Conclusion***

12. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Humayun et al. (U.S. Patent 6,905,556).

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Any inquiry concerning this communication or earlier communications from the examiner should be directed to Nicole Blan whose telephone number is 571-270-1838. The examiner can normally be reached on Monday - Thursday 8-5 and alternating Fridays 8-4.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael Cleveland can be reached on 571-272-1418. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

NRB

  
ALEXANDER MARKOFF  
PRIMARY EXAMINER